



TRANSLATION CERTIFICATION

Date: 2024/05/28

To whom it may concern:

This is to certify that the attached translation is an accurate representation of the documents received by this office. The translation was completed from:

- Korean

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- English (USA)

The document is designated as:

- KR20140088369A

Graciela Rojas, Project Coordinator in this company, attests to the following:

"To the best of my knowledge, the aforementioned documents are a true, full and accurate translation of the specified documents."

A handwritten signature in cursive script, appearing to read "Graciela", written in black ink.

Signature of Graciela Rojas

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IPR2024-01133 - BOE
Exhibit 1008 - Page 1



TRANSLATION CERTIFICATION

Date: May 28, 2024

To whom it may concern:

I, Sean Lee, a translator fluent in the Korean and English languages, on behalf of Morningside, do solemnly and sincerely declare that the following is, to the best of my knowledge and belief, a true and correct translation of the document(s) listed below in a form that best reflects the intention and meaning of the original text.

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(19) Republic of Korea Intellectual
Property Office (KR)
(12) Publicized Patent Publication (A)

(11) Disclosure Number 10-2014-0088369
(43) Disclosure date July 10, 2014

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(22) Application date January 2, 2013	Jingu Chung 95, Samsung 2-ro, Giheung-gu, Yongin-si, Gyeonggi-do (Nongseo-dong)
Evaluation request date None	(74) AGent Pankorea Patent & Law Firm

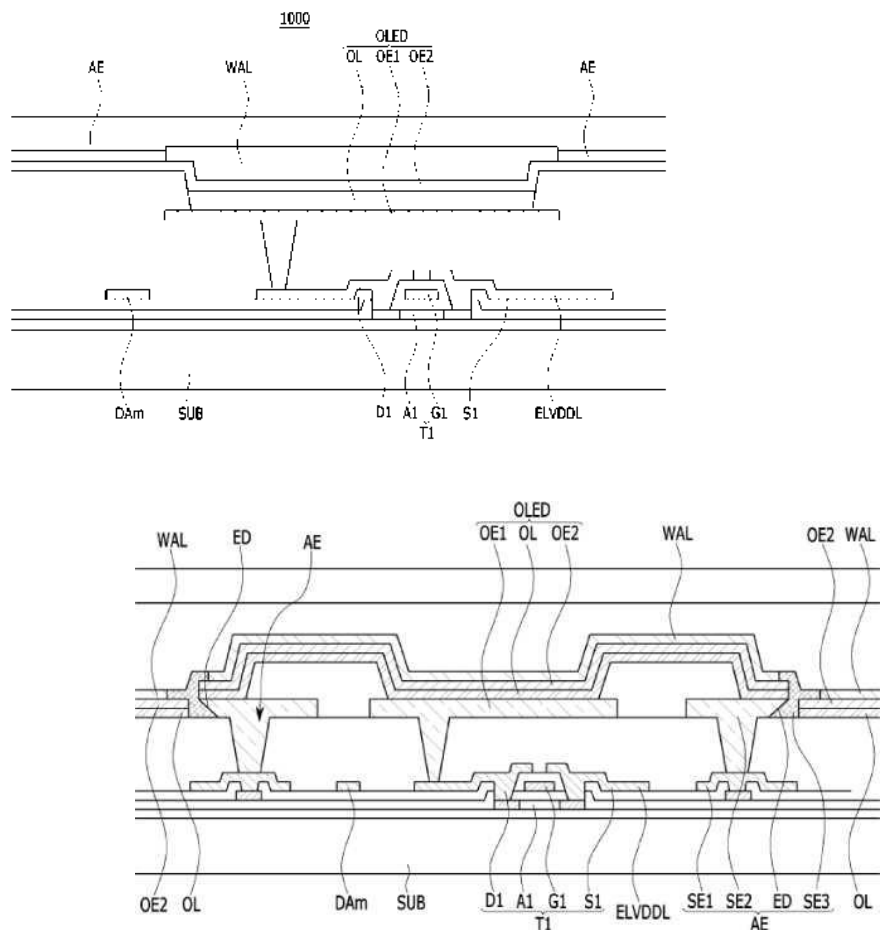
Total number of claims: Total 20 claims

(54) Name of the invention **An organic light emitting diode display**

(57) Summary

The organic light-emitting diode display includes a board, a first electrode located on top of the board, an organic light-emitting diode layer located on top of the first electrode, a second electrode located on top of the organic light-emitting diode layer, an organic layer located on top of the second electrode corresponding to the first electrode, and an auxiliary electrode that is next to the organic layer and comes into contact with the second electrode.

Representative diagram - Figure 3



Scope of claims

Claim 1

An organic light-emitting diode display that includes the following components:

- a board;
- a first electrode located on top of the board;
- an organic light-emitting diode layer located on top of the first electrode;
- a second electrode located on top of the organic light-emitting diode layer;
- an organic layer located on top of the second electrode corresponding to the first electrode;
- and an auxiliary electrode that is next to the organic layer and comes into contact with the second electrode.

Claim 2

The organic light-emitting diode display of Claim 1,
wherein the organic layer comes into contact with the second electrode.

Claim 3

The organic light-emitting diode display of Claim 2,
wherein the organic layer includes lithium quinoline (LiQ).

Claim 4

The organic light-emitting diode display of Claim 2,
wherein the auxiliary electrode is located on top of the second electrode.

Claim 5

The organic light-emitting diode display of Claim 4,
wherein the first electrode is composed of multiple electrodes, wherein each of the multiple first electrode is located on top of the board spaced apart from each other,
and wherein the second electrode is located across the entire surface of the board.

Claim 6

The organic light-emitting diode display of Claim 5,
wherein the organic layer is composed of multiple layers, and wherein each of the organic layers is located on top of the second electrode, spaced apart from each other.

Claim 7

The organic light-emitting diode display of Claim 6,
wherein the auxiliary electrode is composed of multiple electrodes, and wherein each of the multiple auxiliary electrodes is located between the neighboring organic layers, spaced apart from each other.

Claim 8

The organic light-emitting diode display of Claim 7,
wherein each of the multiple auxiliary electrodes extends in one direction on the board.

Claim 9

The organic light-emitting diode display of Claim 8,
wherein each of the multiple auxiliary electrodes is arranged in another direction intersecting the one direction on the board.

Claim 10

The organic light-emitting diode display of Claim 7,
wherein the multiple auxiliary electrodes include
multiple first sub-auxiliary electrodes that extend in one direction on the board and are arranged in another direction that intersects the one direction; and
multiple second sub-auxiliary electrodes that extend in another direction on the board and are arranged in the one direction.

Claim 11

The organic light-emitting diode display of Claim 10,
wherein the multiple first sub-auxiliary electrodes and the multiple second sub-auxiliary electrodes are formed in the shape of meshes.

Claim 12

The organic light-emitting diode display of any one of Claim 1 to Claim 11,
wherein regarding the auxiliary electrodes, adhesiveness between the organic layers is less than adhesiveness between the organic layer and the second electrode.

Claim 13

The organic light-emitting diode display of Claim 12,
wherein the auxiliary electrode contains magnesium (Mg).

Claim 14

The organic light-emitting diode display of Claim 2 that further includes:
a thin film transistor that includes an active layer located on top of the board, a gate electrode located on top of the active layer, and a drain electrode that connects the active layer and the first electrode,
wherein the auxiliary electrode includes
a first auxiliary electrode located in the same layer as one or more of the active layer, the gate electrode, and the drain electrode
a second auxiliary electrode that is located in the same layer as the first electrode, and that is connected to the first auxiliary electrode; and
a third auxiliary electrode that connects the second auxiliary electrode and the second electrode.

Claim 15

The organic light-emitting diode display of Claim 14,
wherein the end of the second auxiliary electrode unit is tapered,
wherein the second electrode is located across the entire surface of the board while being spaced apart from the end of the second auxiliary electrode unit, and

wherein the third auxiliary electrode unit is obliquely deposited at the end of the second auxiliary electrode unit.

Claim 16

The organic light-emitting diode display of Claim 15,

wherein the organic light-emitting diode layer is located across the entire surface of the board while being spaced apart from the end of the second auxiliary electrode unit.

Claim 17

The organic light-emitting diode display of Claim 15,

wherein the organic layer is composed of multiple layers, and each of the multiple organic layers is located on the second electrode, spaced apart from each other, exposing a portion of the second electrode adjacent to the end of the second auxiliary electrode unit.

Claim 18

The organic light-emitting diode display of Claim 17,

wherein the auxiliary electrode is composed of multiple electrodes, and the third auxiliary electrode of each of the multiple auxiliary electrodes is located between neighboring organic layers.

Claim 19

The organic light-emitting diode display of any one of Claims 14 to 18,

wherein adhesiveness between the third auxiliary electrode unit of the auxiliary electrode and the organic layer is less than adhesiveness between the organic layer and the second electrode.

Claim 20

The organic light-emitting diode display of Claim 19,

wherein the third auxiliary electrode unit of the auxiliary electrode contains magnesium (Mg).

Statement

Technological field

[0001] The present invention pertains to an organic light-emitting diode display, and more specifically the present invention pertains to an organic light-emitting diode display that emits light on the front surface to display images.

Background technology

[0002] Recently, organic light-emitting diode displays are becoming popular as image display devices.

[0003] Unlike liquid crystal display devices, organic light-emitting diode displays do not require separate light sources, so it is possible to reduce thickness and weight. Also, organic light-emitting diode displays have high-quality features such as low level of electric power consumption, high level of brightness, high response speed, and so on.

[0004] The conventional organic light-emitting diode display includes the first electrode, an organic light-emitting diode layer located on top of the first electrode, and the second electrode located on top of the organic light-emitting diode layer.

[0005] On the other hand, organic light-emitting diode displays are classified into those that emit light on the front surface and those emitting light on the rear surface, and those that emit light on both surfaces. Regarding the organic light-emitting diode display of the type that emits light on the front surface, the

second electrode of the organic light-emitting diodes is formed over the entire board on which the organic light-emitting diodes are formed as a thin film.

[0006] However, due to the fact that the second electrode of the type of the organic light-emitting diode display that emits light on the front surface is formed on the entire board as a thin film, such issues as voltage drops occur at the power source that passes through the second electrode to operate the organic light-emitting diode layer.

Details of the invention

Issues to resolve

[0007] An embodiment of the present invention was devised in order to resolve the issues described above, and the purpose of the embodiment is to provide an organic light-emitting diode display that can minimize voltage drops of the power source that passes through the electrode, which is a thin film and large in area, in order to operate the organic light-emitting diode layer.

Methods to resolve the issues

[0008] An embodiment of the present invention to resolve the technological issues described above provides an organic light-emitting diode display that includes the first electrode located on top of the board, an organic light-emitting diode layer located on top of the first electrode, the second electrode located on top of the organic light-emitting diode layer, an organic layer located on top of the second electrode corresponding to the first electrode, and an auxiliary electrode that is next to the organic layer and comes into contact with the second electrode.

[0009] The organic layer can come into contact with the second electrode.

[0010] The organic layer may contain lithium quinoline (LiQ).

[0011] The auxiliary electrode may be located on top of the second electrode.

[0012] The first electrode is composed of multiple electrodes, and each of the first multiple electrodes may be located on top of the board spaced apart from each other, and the second electrode may be located across the entire surface of the board.

[0013] The organic layer is composed of multiple layers, and each of the multiple organic layers may be located on top of the second electrode spaced apart from each other.

[0014] The auxiliary electrode is composed of multiple electrodes, and each of the auxiliary electrodes may be located between the neighboring organic layers spaced apart from each other.

[0015] Each of the multiple auxiliary electrodes may extend in one direction on the board.

[0016] Each of the multiple auxiliary electrodes may be arranged in another direction that intersects with the one direction on the board.

[0017] The multiple auxiliary electrodes may include multiple first sub-auxiliary electrodes that extend in one direction on the board and are arranged in another direction that intersects with the one direction, and multiple second sub-auxiliary electrodes that extend in another direction on the board and are arranged in the one direction.

[0018] The multiple first sub-auxiliary electrodes and the multiple second sub-auxiliary electrodes may be formed in mesh shapes.

[0019] Regarding the auxiliary electrode, adhesiveness between the organic layers could be less than adhesiveness between the organic layer and the second electrode.

[0020] The auxiliary electrode may contain magnesium (Mg).

[0021] It may further include a thin transistor that includes an active layer located on top of the board, a gate

electrode located on top of the active layer, and a drain electrode that connects the active layer and the first electrode, wherein the auxiliary electrode includes an active layer, the gate electrode, and the first auxiliary electrode located on top of the same layer as one or more of the drain electrodes, the second auxiliary electrode that is located on top of the same layer as the first electrode, and that is connected to the first auxiliary electrode, and the third auxiliary electrode that connects the second auxiliary electrode and the second electrode.

[0022] The end of the second auxiliary electrode unit may be tapered, the second electrode may be located across the entire surface of the board while being spaced apart from the end of the second auxiliary electrode, and the third auxiliary electrode may be obliquely deposited to the end of the second auxiliary electrode unit.

[0023] The organic light-emitting diode layer may be located across the entire surface of the board while being spaced apart from the end of the second auxiliary electrode unit.

[0024] The organic layer is composed of multiple layers, and each of the multiple organic layers may be located on top of the second electrode to partially expose the second electrode that is next to the end of the second auxiliary electrode while being spaced apart from each other.

[0025] The auxiliary electrode is composed of multiple electrodes, and each of the multiple auxiliary electrodes may be located between neighboring organic layers.

[0026] The adhesiveness between the third auxiliary electrode unit of the auxiliary electrode and the organic layer may be less than the adhesiveness between the organic layer and the second electrode.

[0027] The third auxiliary electrode unit of the auxiliary electrode may contain magnesium (Mg).

Effects of the invention

[0028] According to an embodiment of the methods to resolve the issues under the present invention described previously, an organic light-emitting diode display is proposed that may minimize voltage drops of the power source that passes through the electrode, which is a thin film, and which covers a large area, to operate the organic light-emitting diode layer.

Brief description of the drawings

[0029] Figure 1 is a drawing that illustrates the organic light-emitting diode display in accordance with the first embodiment of the present invention.

Figure 2 is a layout diagram that illustrates part A of Figure 1.

Figure 3 is a cross-sectional diagram in accordance with Figure 2 III-III.

Figure 4 is a drawing that illustrates the organic light-emitting diode display in accordance with the second embodiment of the present invention.

Figure 5 is a cross-sectional diagram that illustrates the organic light-emitting diode display in accordance with the third embodiment of the present invention.

Specific details to implement the present invention

[0030] Below, various embodiments of the present invention will be described in detail by referring to the attached drawings so that anyone with an ordinary level of knowledge in the field to which the present invention belongs will be able to easily implement the present invention. The present invention may be implemented in various forms and is not limited to those embodiments that are described here.

[0031] In order to clearly describe the present invention, those parts that are unrelated to the description will be omitted, and the same parts or similar components throughout the entire statement will be assigned the same part number.

- [0032] Also, the size and thickness of each component illustrated in the drawings are provided for the convenience of description, and the present invention is not limited by the illustrations.
- [0033] In order to clearly delineate various layers and areas in the drawings, thickness has been expanded. Also, some layers and areas in the drawings were exaggerated for the convenience of description. When it is stated that a layer, film, or plate is located “on” another part, it not only means that such a part is “on” another part but also means that there may be other parts in the middle.
- [0034] Also, when it is stated in the entire statement that a part “includes” certain components, this doesn't mean that other components are excluded, but rather that other components may be further included unless contrary indication is provided. Also, in the entire statement, when it is stated, “on top of something,” it means the top or bottom, and the expression doesn't necessarily mean the top side based on the direction of gravity.
- [0035] Below, the organic light-emitting diode display in accordance with the first embodiment of the present invention will be described by referring to Figure 1 to Figure 3.
- [0036] Figure 1 is a drawing that illustrates the organic light-emitting diode display in accordance with the first embodiment of the present invention.
- [0037] As illustrated in Figure 1, the organic light-emitting diode display (1000) in accordance with the first embodiment of the present invention includes a board (SUB), a gate driver (GD), gate wires (GW), a data driver (DW), an organic layer (WAL) (illustrated in Figure 2), an auxiliary electrode (AE), and pixels (PE). Here, the term pixel (PE) refers to the smallest unit that delineates images, and the organic light-emitting diode display (1000) displays images through multiple pixels (PE).
- [0038] The board (SUB) is formed of a transparent insulating board composed of glass, quartz, ceramic, and plastic. However, the first embodiment of the present invention is not limited to this. Rather, the board (SUB) may be a metallic board composed of stainless steel, and so on. Also, if the board (SUB) is composed of plastic, and so on, the organic light-emitting diode display (1000) may be flexible, stretchable, or rollable.
- [0039] The gate driver (GD) consecutively transmits scan signals to the gate wires (GW) corresponding to the control signals provided by an external control circuit, such as a timing controller, which is not illustrated. Then, the pixels (PE) are selected by the scan signals to consecutively receive data signals.
- [0040] The gate wires (GW) are located on top of the sub (SUB) and extend in the first direction. The gate wires (GW) include scan lines (SC1 to SCn), and each scan line (SCn) is connected to the gate driver (GD) to receive scan signals from the gate driver (GD).
- [0041] On the other hand, regarding the organic light-emitting diode display (1000) in accordance with the first embodiment of the present invention the gate wires (GW) include the scan line (SCn), but regarding the organic light-emitting diode display in accordance with another embodiment of the present invention the gate wires may further include additional scan lines, initializing power lines, light emitting control lines, and so on. In this case, the organic light-emitting diode display may be an active matrix (AM) type organic light-emitting diode display in the 6Tr-2Cap structure.
- [0042] The data driver (DD) supplies data signals to the data lines (DA1 to DAm) among the data wires (DW) corresponding to the control signals supplied from the outside such as the timing controller, and so on. The data signals supplied to the data line (DAm) are supplied to the pixels (PE) selected by the scan signals whenever scan signals are supplied to the scan line (SCn). Then, the pixels (PE) are charged with a voltage corresponding to the data signals, and then emit the corresponding brightness.
- [0043] The data wires (DW) may be located on top of the gate wires (GW) or may be located between the gate wires (GW) and the board (SUB) and extend in the second direction that intersects with the first direction. The data wires (DW) include a data line (DAm) and a driver power source line (ELVDDL). The data line (DAm) is connected to the data driver (DD) and receives data signals from the data driver

(DD). The driver power source line (ELVDDL) is connected to the first power source (ELVDD) and receives driver power source from the first power source (ELVDD).

[0044] The organic layer (WAL) (illustrated in Figure 2) will be described later.

[0045] The auxiliary electrode (AE) is located on top of the second electrode (OE2), which will be described later, and comes into contact with the second electrode (OE2), and extends in the second direction, which is one of the directions on top of the board (SUB). The auxiliary electrode is composed of multiple electrodes, and each of the multiple electrodes is located between neighboring pixels (PE) with the pixels (PE) spaced apart from each other. Each of the multiple auxiliary electrodes (AE) is arranged in the first direction, which is another direction that intersects with the second direction. The auxiliary electrode (AE) will be described in detail later.

[0046] The pixels (PE) are located at the intersection area of the gate wires (GW) and data wires (DW) between the auxiliary electrodes (AE), and include organic light-emitting diodes, multiple thin film transistors to control the driver electric currents that flow to the organic light-emitting diodes, and one or more capacitors. Multiple thin film transistors and one or more capacitors are connected to each of the gate wires (GW) and data wires (DW), and the organic light-emitting diodes are connected to the multiple thin film transistors and one or more capacitors. The organic light-emitting diodes are connected between the first power source (ELVDD) and the second power source (ELVSS).

[0047] Figure 2 is a layout diagram that illustrates A of Figure 1. Figure 3 is a cross-sectional diagram in accordance with Figure 2 III-III.

[0048] As illustrated in Figure 2 and Figure 3, the pixels (PE) include organic light-emitting diodes (OLED) connected between the first power source (ELVDD) and the second power source (ELVSS), and a pixel circuit that is connected between the organic light-emitting diodes (OLED) and the first power source (ELVDD) to control the driver power source supplied to the organic light-emitting diodes (OLED), equipped with 2 thin film transistors and a capacitor.

[0049] The pixel circuit includes the first thin film transistor (T1), the second thin film transistor (T2), and a capacitor (C).

[0050] The first thin film transistor (T1) is connected between the driver power source line (ELVDD) and the first electrode (OE1) of the organic light-emitting diodes (OLED), and supplies driver power source corresponding to data signals during the lighting period of the pixels (PE) from the first power source (ELVDD) to the organic light-emitting diodes (OLED) corresponding to the data signals. Namely, the first thin film transistor (T1) acts as the driver transistor of the pixels (PE).

[0051] The first thin film transistor (T1) includes the first source electrode (S1), the first drain electrode (D1), the first active layer (A1), and the first gate electrode (G1).

[0052] The first source electrode (S1) is connected to the driver power source line (ELVDDL), and the first drain electrode (D1) is spaced apart from the first source electrode (S1) between the first active layer (A1) and connected to the organic light-emitting diodes (OLED). Although the first source electrode (S1) and the first drain electrode (D1) are formed as separate layers from the first active layer (A1), it is possible for the first source electrode (S1) and the first drain electrode (D1) to be formed in the same layer as the first active layer (A1). In this case, impure materials may be contained in the first source electrode (S1) and the first drain electrode (D1).

[0053] The first active layer (A1) is located between the first source electrode (S1) and the first drain electrode (D1). The first active layer (A1) may be composed of poly-silicon or oxide semi-conductor. The oxide semiconductor may contain any one of an oxide based on zinc (Zn), gallium (Ga), tin (Sn), or compound oxides of these, such as indium (In), zinc oxide, indium-gallium-zinc oxide (InGaZnO_4), indium-zinc oxide (Zn-In-O), or zinc-tin-oxide (Zn-Sn-O). If the first active layer (A1)

is composed of an oxide semiconductor, a separate protective layer may be added on the first active

layer (A1) in order to protect the oxide semiconductor, which is weak against the external environment, such as high temperature. The first active layer (A1) is classified into the channel area, source area, and drain area, and there may be impure materials in each of the source area and the drain area.

- [0054] The first gate electrode (G1) is located on top of the first active layer (A1) and is connected to the second drain electrode (D2) of the second thin film transistor (T2).
- [0055] The second thin film transistor (T2) is connected between the data line (DAm) and the first thin film transistor (T1). The second thin film transistor transmits the data signals supplied from the data line (DAm) into the pixels (PE) when scan signals are supplied from the scan line (SCn). Namely, the second thin film transistor acts as the switching transistor of the pixels (PE).
- [0056] The second thin film transistor (T2) includes the second source electrode (S2), the second drain electrode (D2), the second active layer (A2), and the second gate electrode (G2).
- [0057] The second source electrode (S2) is connected to the data line (DAm), and the second drain electrode (D2) is connected to the first gate electrode (G1) of the first thin film transistor (T1). Although the second source electrode (S2) and the second drain electrode (D2) are formed as separate layers from the second active layer (A2), the second source electrode (S2) and the second drain electrode (D2) may be formed on the same layer as the second active layer (A2). In this case, it is possible that there may be impure materials in the second source electrode (S2) and the second drain electrode (D2).
- [0058] The second active layer (A2) may be located between the second source electrode (S2) and the second drain electrode (D2). The second active layer (A2) may be formed on the same layer as the first active layer (A1) on the board (SUB) and may be composed of the same material. The second active layer (A2) may be composed of poly-silicon or oxide semiconductor. The second active layer (A2) is classified into the channel area, source area, and drain area, and there may be impure materials in each of the source area and the drain area.
- [0059] The second gate electrode (G2) is located on top of the second active layer (A2) and is connected to the scan line (SCn).
- [0060] The capacitor (C) includes the first capacitor electrode (CE1) and the second capacitor electrode (CE2), which face each other with the insulation layer between them. The second capacitor electrode (CE2) is connected to the driver power source line (ELVDDL), and the first capacitor electrode (CE1) is connected to the second drain electrode (D2) and the first gate electrode (G1).
- [0061] The organic light-emitting diode (OLED) includes the first electrode (OE1), the organic light-emitting diode layer (OL) located on top of the first electrode (OE1), and the second electrode (OE2) located on top of the organic light-emitting diode layer (OL). The first electrode (OE1), which is the anode electrode of the organic light-emitting diodes (OLED) accesses the driver power source line (ELVDDL), which is connected to the first power source (ELVDD), via the pixel circuit, and the second electrode (OE2), which is the cathode electrode of the organic light-emitting diodes (OLED), accesses the second power source (ELVSS).
- [0062] The first electrode (OE1) is composed of multiple electrodes located across the entire board (SUB), and each of the multiple first electrodes (OE1) is located on top of the board (SUB) spaced apart from each other. The second electrode (OE2) is located across the entire surface of the board (SUB).
- [0063] The organic light-emitting diode layer (OL) of the organic light-emitting diodes (OLED) is supplied with driver power source via the pixel circuit, and emits light at the brightness level corresponding to the driver electric currents flowing to the organic light-emitting diodes (OLED) when common power source is supplied from the second power source (ELVSS). The organic light-emitting diode layer (OL) of the organic light-emitting diodes (OLED) may be composed of low molecular organic materials or high molecular organic materials such as PEDOT (poly 3, 4-ethylenedioxythiophene). Also, the organic light-emitting diode layer (OL) may be composed of multiple layers containing at least one of a light-emitting diode layer, a hole injection layer (HIL), a hole transporting layer (HTL), an electron transporting layer (ETL), and an electron injection layer (EIL). If all of these components are included,

the components are arranged with the hole injection layer on top of the first electrode (OE1), which is an anode, followed by the hole transporting layer, the light-emitting layer, the electron transporting layer, and the electron injection layer, in that order. The organic light-emitting diode layer (OL) may include a red organic light-emitting diode layer that emits red color, a green organic light-emitting diode layer that emits green color, and a blue organic light-emitting diode layer that emits blue color, and each of the red organic light-emitting diode layer, the green organic light-emitting diode layer, and the blue organic light-emitting diode layer is formed in the red pixel, the green pixel, and the blue pixel, respectively, to implement color images. Also, the organic light-emitting diode layer (OL) is able to implement color images by layering the red organic light-emitting diode layer, the green organic light-emitting diode layer, and the blue organic light-emitting diode layer on all of the red pixel, the green pixel, and the blue pixel, and by forming red color filters, green color filters, and blue color filters for each pixel type. In another example, it is possible to implement color images by forming a white organic light-emitting diode layer that emits white color on all of the red pixel, the green pixel, and the blue pixel, and by forming red color filters, green color filters, and blue color filters for each pixel type. If color images are implemented by using a white organic light-emitting diode layer and color filters, it is possible to omit the use of an attachment to form each of the red organic light-emitting diode layer, green organic light-emitting diode layer, and blue organic light-emitting diode layer, which is advantageous for improving resolution.

- [0064] When the second thin film transistor (T2) described previously is instantaneously turned on, power source is supplied to the second capacitor electrode (CE2) of the capacitor (C) from the driver power line (ELVDDL) at the same time the power source is supplied from the data line (Dam) through the second thin film transistor (T2) to the first capacitor electrode (CE1), so that the capacitor accumulates power. Here, the amount of electric charges accumulated is proportional to the voltage provided by the data line (Dam). Also, the gate potential of the first thin film transistor (T1) when the second thin film transistor (T2) is turned off increases according to the potential accumulated in the capacitor (C). Also, the first thin film transistor (T1) is turned on when the gate potential exceeds the threshold voltage. Then, the voltage provided to the driver power source line (ELVDDL) is provided to the organic light-emitting diodes (OLED) through the first thin film transistor (T1), and as a result the organic light-emitting diodes (OLED) emit light.
- [0065] The layout of the pixels (PE) is not limited to the layouts described previously, and it will be possible for those who work in the applicable technological fields to easily modify the layout in various ways.
- [0066] The organic layer (WAL) and the auxiliary electrode (AE) are located on top of the second electrode (OE2) described previously.
- [0067] The organic layer (WAL) comes into contact with the second electrode (OE2) on top of the second electrode (OE2) facing the first electrode (OE1). The organic layer (WAL) is composed of multiple layers, and each of the multiple organic layers (WAL) is located on top of the second electrode (OE2) spaced apart from each other. The organic layer (WAL) contains lithium quinoline (LiQ), which is an organic material that has poor adhesiveness with metals and that is transparent. The organic layer (WAL) may be formed on top of the second electrode (OE2) by using a MEMS process such as photolithography. Adhesiveness between the organic layer (WAL) and the auxiliary electrode (AE) is less than adhesiveness between the organic layer (WAL) and the second electrode (OE2).
- [0068] The auxiliary electrode (AE) is located next to the organic layer (WAL) and comes into contact with the second electrode (OE2) on top of the second electrode (OE2). The auxiliary electrode (AE) is composed of multiple electrodes, and each of the multiple auxiliary electrodes (AE) is located between neighboring organic layers (WAL) that are spaced apart from each other. Each of the multiple auxiliary electrodes (AE) extends in the second direction, which is one direction, on the board (SUB), and is arranged in the first direction, which is another direction. The auxiliary electrode (AE) contains magnesium (Mg). Due to the fact that the auxiliary electrode (AE) contains magnesium and the organic layer (WAL) contains lithium quinoline, adhesiveness between the auxiliary electrode (AE) and the organic layer (WAL) is less than adhesiveness between the second electrode (OE2) and the organic

layer (WAL).

- [0069] The auxiliary electrode (AE) may be formed using the metal self patterning technology. Specifically, if auxiliary electrodes (AE) are formed across the entire surface of the board (SUB) after multiple organic layers (WAL) spaced apart from each other are formed on the second electrode (OE2), the auxiliary electrodes (AE) are located only between the neighboring organic layers (WAL) where organic layers are not formed due to poor adhesiveness between the organic layers (WAL) and the auxiliary electrodes (AE) to come into contact with the second electrode (OE2).
- [0070] As described previously, with the organic light-emitting diode display (1000) in accordance with the first embodiment of the present invention, the organic layer (WAL) corresponding to the first electrode (OE1) and the neighboring auxiliary electrode (AE) come into contact with the second electrode (OE2), so that the second electrode (OE2) on which the auxiliary electrode (AE) is located forms the back film overall. This decreases the surface resistance of the second electrode (OE2), and as a result voltage drops of the second power source (ELVSS) that passes through the second electrode (OE2), which is a thin film covering a large area for driving purposes, are minimized. Namely, even for a large area an organic light-emitting diode display (1000) that minimizes voltage drops is provided.
- [0071] Below, the organic light-emitting diode display in accordance with the second embodiment of the present invention will be described by referring to Figure 4.
- [0072] Below, only the parts that are distinct from the first embodiment will be described, and for the areas in which descriptions are omitted, the first embodiment will be followed. Also, for convenience of description, in the second embodiment the same reference numbers used for the first embodiment of the present invention will be used for the same components.
- [0073] Figure 4 is a drawing that illustrates the organic light-emitting diode display in accordance with the second embodiment of the present invention.
- [0074] As described in Figure 4, the multiple auxiliary electrodes (AE) of the organic light-emitting diode display (1002) in accordance with the second embodiment of the present invention include multiple first sub-auxiliary electrodes (SAE1) and multiple second sub-auxiliary electrodes (SAE2).
- [0075] Each of the multiple first sub-auxiliary electrodes (SAE1) extends in the second direction, which is one direction, on top of the board (SUB), and is arranged in the first direction, which is another direction.
- [0076] Each of the multiple second sub-auxiliary electrodes (SAE2) extends in the first direction, which is another direction on the board (SUB), and is arranged in the second direction, which is the one direction.
- [0077] The multiple first sub-auxiliary electrodes (SAE1) and the multiple second sub-auxiliary electrodes (SAE2) are located between pixels (PE) located next to the board (SUB), and are in the shape of meshes.
- [0078] As described previously, regarding the organic light-emitting diode display (1002) in accordance with the second embodiment of the present invention, the auxiliary electrode (AE) located next to the organic layer (WAL) located corresponding to the first electrode (OE1) includes the first sub-auxiliary electrode (SAE1) and the second sub-auxiliary electrode (SAE2) in the form of meshes coming into contact with the second electrode (OE2), so that the second electrode (OE2) where the auxiliary electrode (AE) is located forms the back film overall relative to the second electrode (OE2) of the organic light-emitting diode display (1000) in accordance with the first embodiment. As a result, voltage drops of the second power source (ELVSS) that pass through the second electrode (OE2), which is a thin film and covers a large area for driving purposes, are minimized. Namely, even for a large area an organic light-emitting diode display (1002) that minimizes voltage drops is provided.
- [0079] Below, the organic light-emitting diode display in accordance with the third embodiment of the present invention will be described by referring to Figure 5.
- [0080] Below, only the parts that are distinct from the first embodiment will be described, and for the areas in which descriptions are omitted, the first embodiment will be followed. Also, for embodiment 3 of the present invention, for description convenience the same reference numbers will be used as in the first

embodiment of the present invention for the same components.

- [0081] Figure 5 is a cross-sectional diagram that illustrates the organic light-emitting diode display in accordance with the third embodiment of the present invention.
- [0082] As illustrated in Figure 5, the auxiliary electrode (AE) of the organic light-emitting diode display (1003) in accordance with the third embodiment of the present invention includes the first auxiliary electrode unit (SE1), the second auxiliary electrode unit (SE2), and the third auxiliary electrode unit (SE3).
- [0083] The first auxiliary electrode unit (SE1) is located on the same layer as the first gate electrode (G1) and the first drain electrode (D1) on the board, and is composed of the same material. On the other hand, the first auxiliary electrode unit (SE1) may be located on the same layer as one or more of the first gate electrode (G1), first drain electrode (D1), and first active layer (A1), and may be composed of the same material.
- [0084] The second auxiliary electrode unit (SE2) is located on the same layer as the first electrode (OE1), and is composed of the same material as the first electrode (OE1). The second auxiliary electrode unit (SE2) is connected to the first auxiliary electrode unit (SE1) through a conduit formed on the insulation layer. The second auxiliary electrode unit (SE2)'s end (ED) is in a reverse taper form. The second auxiliary electrode unit (SE2) may have a multi-layered structure with ITO/Ag/ITO or AZO/Ag/ITO layered, in that order, and at this time it is possible for the end (ED) of the second auxiliary electrode unit (SE2) to have a reverse taper form by using the etching selectivity.
- [0085] On the other hand, each of the organic light-emitting diode layer (OL) and the second electrode (OE2) is formed across the entire surface of the board (SUB), and due to the fact that the end (ED) of the second auxiliary electrode unit (SE2) is in a reverse-tapered form, each of the second electrode (OE2) and the organic light-emitting diode layer (OL) is located across the entire surface of the board (SUB) spaced apart from the end (ED) of the second auxiliary electrode unit (SE2).
- [0086] The third auxiliary electrode unit (SE3) connects the second auxiliary electrode unit (SE2) and the second electrode (OE2). The third auxiliary electrode unit (SE3) is slope-attached on the end of the second auxiliary electrode unit (SE2). The third auxiliary electrode unit (SE3) contains magnesium (Mg). Due to the fact that the third auxiliary electrode unit (SE3) contains magnesium and the organic layer (WAL) contains lithium quinoline, adhesiveness between the third auxiliary electrode unit (SE3) and the organic layer (WAL) is less than adhesiveness between the second electrode (OE2) and the organic layer (WAL).
- [0087] It is possible to form the third auxiliary electrode unit (SE3) by slope-attaching using the metal self patterning technology. Specifically, if auxiliary electrodes (AE) are formed over the entire surface of the board (SUB) after multiple organic layers (WAL) spaced apart from each other are formed on the second electrode (OE2), the third auxiliary electrode unit (SE3) is located only between the neighboring organic layers (WAL) where organic layers are not formed due to poor adhesiveness between the organic layers (WAL) and the auxiliary electrodes (AE) to come into contact with the second electrode (OE2).
- [0088] The third auxiliary electrode unit (SE3) is located between the neighboring organic layers (WAL).
- [0089] The organic layer (WAL) comes into contact with the second electrode (OE2) on top of the second electrode (OE2) facing the first electrode (OE1). The organic layer (WAL) is composed of multiple organic layers, and each of the multiple organic layers (WAL) is located spaced apart from each other on top of the second electrode (OE2) in order to partially expose the second electrode (OE2) located next to the end (ED) of the second auxiliary electrode unit (SE2). Due to the fact that the end (ED) of the second auxiliary electrode (SE2) is in a reverse-tapered form, the multiple organic layers (WAL) may be located on top of the second electrode (OE2) in order to partially expose the second electrode (OE2) that is located next to the end (ED) of the second auxiliary electrode (SE2).
- [0090] As described previously, regarding the organic light-emitting diode display (1003) in accordance with the third embodiment of the present invention, the auxiliary electrode (AE) located next to the organic

layer (WAL) located corresponding to the first auxiliary electrode unit (SE1) includes the first auxiliary electrode unit (SE1), the second auxiliary electrode unit (SE2), and the third auxiliary electrode unit (SE3) and comes into contact with the second electrode (OE2), so that the second electrode (OE2) on which the auxiliary electrode (AE) is located forms the back film overall. This decreases surface resistance of the second electrode (OE2), and as a result voltage drops of the second power source (ELVSS) that pass through the second electrode (OE2), which is a thin film and covers a large area for driving purposes, are minimized. Namely, an organic light-emitting diode display (1003) that minimizes voltage drops even for a large area is provided.

[0091] Also, regarding the organic light-emitting diode display (1003) in accordance with the present invention, the auxiliary electrode (AE) is not located on top of the second electrode (OE2), so that the overall opening ratio is improved compared to the organic light-emitting diode display (1000) in accordance with the first embodiment described previously, thereby improving the quality of images.

[0092] Although the present invention was described with preferred embodiments indicated previously, the present invention is not limited by these embodiments, and those who work in the technological field to which the present invention belongs will easily understand that it is possible to make various modifications and changes without deviating from the concepts and scope of the claims section that follows.

Description of the parts

[0093] Board (SUB), first electrode (OE1), organic light-emitting diode layer (OL), second electrode (OE2), organic layer (WAL), auxiliary electrode (AE)

Drawings

Figure 1

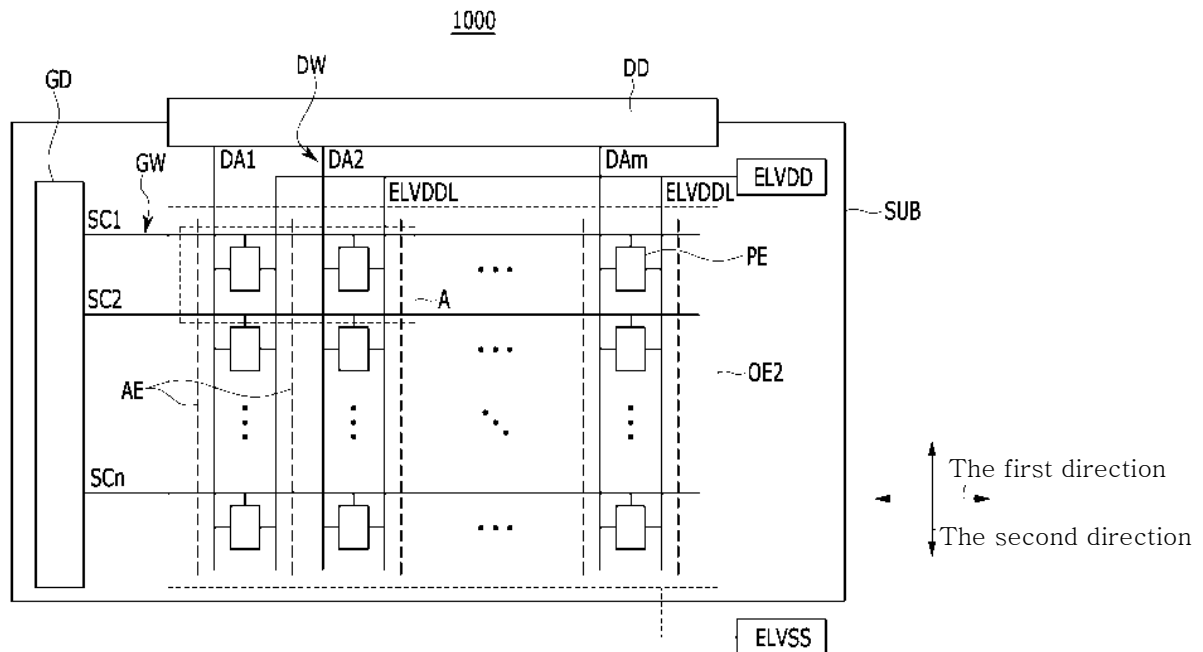


Figure 2

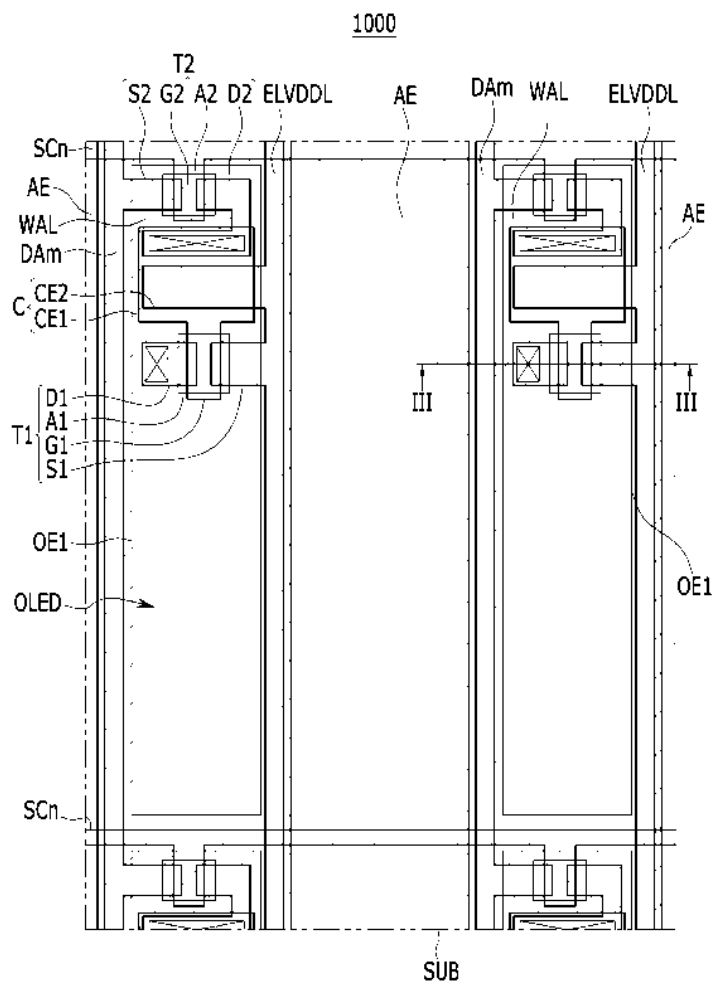


Figure 3

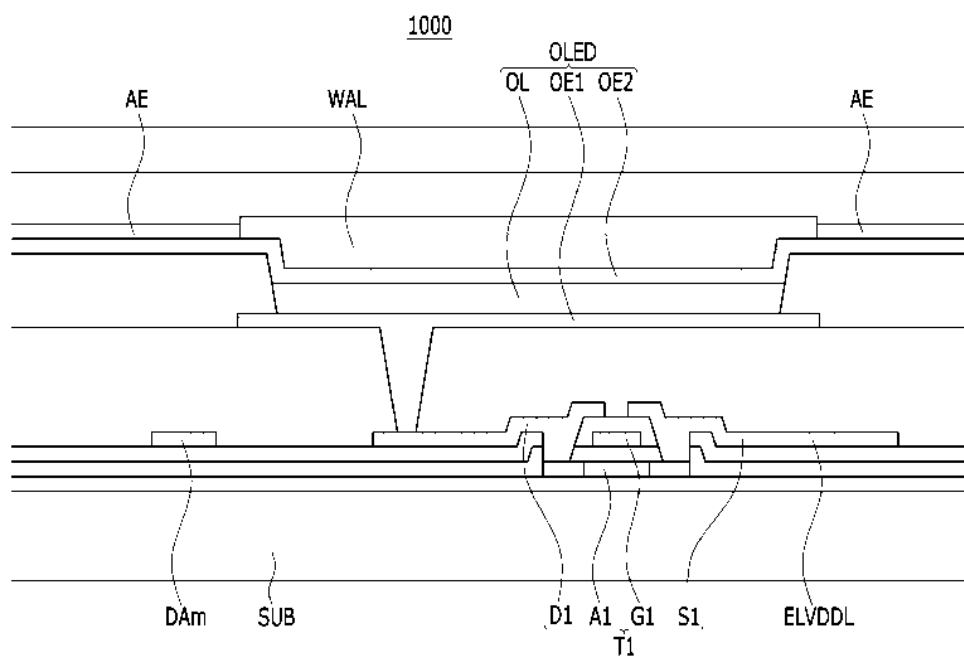


Figure 4

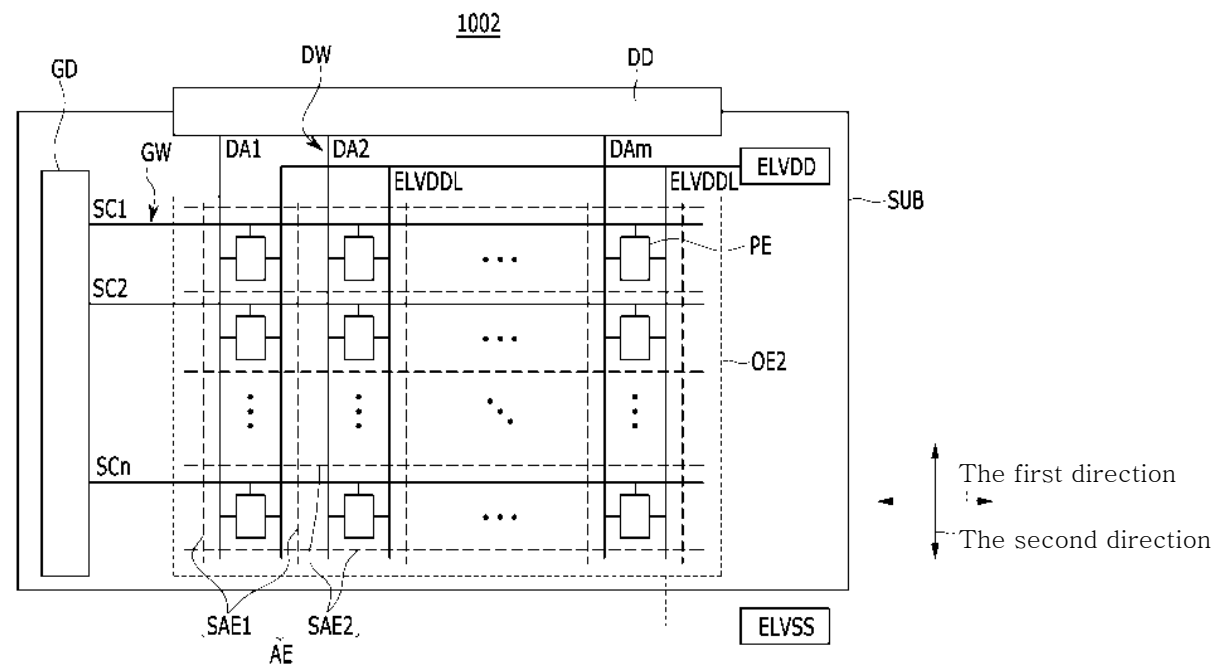


Figure 5

